

## Programmable Logic Application Notes

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This column will be provided each quarter as a source for reliability, radiation results, NASA capabilities, and other information on programmable logic devices and related applications. This quarter's column will include some announcements and some recent radiation test results and evaluations of interest. Specifically, the following topics will be covered: the Military and Aerospace Applications of Programmable Devices and Technologies Conference to be held at GSFC in September, 1998, proton test results, heavy ion test results, and some total dose results.

### MAPLD

Registration is now open for the Military and Aerospace Applications of Programmable Devices and Technologies Conference, to be held at NASA's Goddard Space Flight Center September 15-16, 1998. Late news poster papers are also being accepted. The program will consist of 4 invited talks, 4 technical sessions, a poster session, and an industrial exhibit. For registration and program information, including abstracts, please see <http://rk.gsfc.nasa.gov>.

### NSREC '98

The 35th Annual Nuclear and Space Radiation Effects Conference was held in Newport Beach, California, July 20-24. Several papers were presented covering programmables and ASICs including: *Current Radiation Issues for Programmable Elements and Devices*, R. Katz, et. al., which gives an overview of state-of-the-art technology and their radiation characteristics, *Erasure of Floating Gates in the Natural Radiation Environments of Space*, P. McNulty, et. al., which discussed the floating gate technology, *Single Event Effect and Proton Damage Results for Candidate Spacecraft Electronics*, M. O'Bryan, et. al., which gives a broad overview of recent technologies, *Total Dose and Single Event Effects Testing of UTM Commercial RadHard Gate Arrays*, D. Kerwin, et. al., showing radiation-hard performance, *High Total Dose Response of the UTM Gate Array Fabricated*

at Lockheed-Martin Federal Systems, J. Benedetto, et. al., showing the capability of the ASIC on the radiation-hardened line, *Total Ionizing Dose Effects on Flash Memories*, D. Nguyen, et. al., showing the effect of internal cell structures and charge pumps on radiation performance, *Anatomy of an In-flight Anomaly: Investigation of Proton-Induced SEE Test Results for Stacked IBM DRAMs*, K. LaBel, et. al., discusses test techniques for devices with small cross-sections, including the A1280A, etc., and *Neutron Single Event Upsets in SRAM-based FPGAs*, discusses the performance of an SRAM-based FPGA with neutrons.

### MAPLUG

A military/aerospace programmable logic users group is being formed. The goal of the organization is, similar to other disciplines, promote sharing of ideas, techniques, information, product announcements, alerts, and experiences between users of the technology, parts and reliability engineers, and vendors. Individuals and vendors may join by emailing: [maplug@gsfc.nasa.gov](mailto:maplug@gsfc.nasa.gov). There will be no fee and no advertising. Membership lists will by default not be distributed as we wish to remain spam-free.

### Proton Test Results from IUCF

A variety of FPGAs and a quick-turn ASIC was tested at the Indiana University Cyclotron Facility in June, 1998. All tests were run with ~ 193 MeV protons; the fluence varied according to the part type and test being performed. Devices tested were the RH1020, QL3025, A1280A/MEC, A54SX16 prototype (CSM), RT54SX16 prototype (MEC), and the QYH530 (Yamaha, two lots). The internal code name 'CKJ911' was used for the A54SX16 prototype in the test report.

Below are reports on each of the tests. These are available on-line at <http://rk.gsfc.nasa.gov>. Key results included good SEU performance of the 0.35  $\mu\text{m}/3.3\text{V}$  devices from Actel and Quicklogic. Small cross-sections were measured for the RH1020 and the A1280A devices. No upsets were detected in the QYH530, operated at  $V_{CC} = 3.3\text{VDC}$ .

Total dose responses of the devices involved in this test was also measured, with  $I_{CC}$  vs. total dose curves given for many of the devices; tables are provided for some. There was reasonable agreement between the radiation response with protons and the Cobalt-60 radiation tests. No latchups, clock upsets, or configuration upsets were detected from SEU affects.



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AV: Hardcopy - A03 CASI A03 (14p)/Microfiche - A01 CASI A01 (14p)

SC: 73 (Nuclear and High-Energy Physics)

CTMJ: AEROSPACE ENGINEERING/PROGRAMMABLE LOGIC DEVICES/MILITARY  
TECHNOLOGY/PROTONS

CTMN: RELIABILITY/DOSAGE/CONFERENCES

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